

Ecological site R010XC057OR

SR Shallow Escarpment

9-12 PZ

Last updated: 3/10/2025
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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 010X–Central Rocky and Blue Mountain Foothills

This MLRA is characterized by gently rolling to steep hills, plateaus, and low mountains at the foothills of the Blue Mountains in Oregon and the Central Rocky Mountains in Idaho. The geology of this area is highly varied and ranges from Holocene volcanics to Cretaceous sedimentary rocks. Mollisols are the dominant soil order and the soil climate is typified by mesic or frigid soil temperature regimes, and xeric or aridic soil moisture regimes. Elevation ranges from 1,300 to 6,600 feet (395 to 2,010 meters), increasing from west to east. The climate is characterized by dry summers and snow dominated winters with precipitation averaging 8 to 16 inches (205 to 405 millimeters) and increasing from west to east. These factors support plant communities with shrub-grass associations with considerable acreage of sagebrush grassland. Big sagebrush, bluebunch wheatgrass, and Idaho fescue are the dominant species. Stiff sagebrush, low sagebrush, and Sandberg bluegrass are often dominant on sites with shallow restrictive layers. Western juniper is one of the few common tree species and since European settlement has greatly expanded its extent in Oregon. Nearly half of the MLRA is federally owned and managed by the Bureau of Land Management. Most of the area is used for livestock grazing with areas accessible by irrigation often used for irrigated agriculture.

Classification relationships

US National Vegetation Classification: Note: (this is a the closest approximation, however, this association is described as occurring on deep soils with an Idaho fescue dominated herbaceous component) Group: G302- Intermountain Mesic Tall Sagebrush Steppe & Shrubland Alliance: A318-. Artemisia tridentata ssp. wyomingensis Mesic Steppe & Shrubland Alliance Association: CEG001048 - Artemisia tridentata ssp. wyomingensis - Peraphyllum ramosissimum / Festuca idahoensis Shrubland Landfire Biophysical Setting: 0711250: Inter-Mountain Basins Big Sagebrush Steppe

Ecological site concept

In reference condition, this site supports a plant community dominated by Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and antelope bitterbrush (*Purshia tridentata*), with Wild crab apple (*Peraphyllum ramosissimum*) often present. Abiotically, this site is typified by very shallow soils over fractured bedrock on eroded terrace and escarpment landforms. Bedrock fracturing allows for big sagebrush to persist where site conditions would otherwise favor rigid sagebrush (*Artemisia rigida*). The climate of the site is typified by 9 to 12 inches of annual precipitation, a mesic soil temperature regime and an aridic soil moisture regime. Historical ecological dynamics would have been driven by infrequent fire, insect outbreaks and periodic drought. Presently, livestock grazing and exotic plant invasion have altered ecological dynamics and influence the composition of many of these communities.

Associated sites

R010XC021OR	SR Clayey 9-12 PZ Deeper soils
R010XC035OR	SR Shallow 9-12 PZ Shallow rather than very shallow soils, higher production

Similar sites

R010XC035OR	SR Shallow 9-12 PZ Shallow rather than very shallow, higher production
R010XC052OR	SR Shallow South Schist 9-12 PZ Shallow soil over metamorphic rock rather than very shallow soils, south aspects
R010XC041OR	SR Very Shallow Rockland 12-16 PZ Higher precipitation
R010XC042OR	SR Juniper Tableland 12-16 PZ Higher precipitation
R010XC056OR	SR Terrace Escarpment 9-12 PZ Shallow to deep rather than very shallow soils
R010XC038OR	SR Very Shallow 9-12 PZ Lithic or duripan restrictive layer rather than paralithic contact
R010XC039OR	SR Very Shallow 12-16 PZ Higher precipitation
R010XC036OR	SR Shallow Cool 9-12 PZ Shallow rather than very shallow, higher production
BX010X00C050	Shallow South 9-12 PZ Snake River Warm Plains Shallow rather than very shallow soils, south aspects

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. wyomingensis</i> (2) <i>Peraphyllum ramosissimum</i>
Herbaceous	(1) <i>Pseudoroegneria spicata ssp. spicata</i> (2) <i>Achnatherum thurberianum</i>

Physiographic features

This site occurs on hillsides, escarpments and eroded terraces. It is largely distributed across the foothills of the Blue mountains at the northern edge of the Great Basin. This site occurs on all aspects and on slopes ranging from 2 to 40 percent. Elevations typically range from 3,400 to 4,100 feet (1,050 to 1,250 meters). No water table is present within the upper 100 inches of soil and the site is not subject to ponding or flooding.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Terrace (2) Foothills > Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	1,040 – 1,250 m
Slope	0 – 40 %
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The mean annual precipitation ranges from 9 to 12 inches (230 to 300mm), most of which occurs as snow during October through March. The mean annual air temperature ranges from 45 to 49° F (7 to 9.5° C). The average frost-free period is from 80 to 100 days. The soil temperature regime is mesic and the soil moisture regime is aridic. The period of primary plant growth is from April through July. Climate graphs are based on the nearest available climate stations to representative site locations and are provided to indicate general climate patterns.

Table 3 Representative climatic features

Frost-free period (characteristic range)	80-100 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	230-310 mm
Frost-free period (average)	90 days
Freeze-free period (average)	
Precipitation total (average)	280 mm

- (2) RIVERSIDE 7 SSW [USC00357208], Burns, OR

Influencing water features

This site is not influenced by adjacent or on site water features.

Wetland description

Not applicable

Soil features

The soils of this site are typically very shallow but may range to shallow. These are well to moderately well drained soils that formed in residuum and loess from tuffaceous rocks, and diatomaceous and lacustrine sediments. The profile contains 10 to 50 percent rock fragments mainly as gravels and cobbles. Percent clay ranges from 12 to 40 percent. The soil surface range from 1 to 5 inches (2.5 to 13 cm) thick and are typically gravelly loams. The subsurface ranges from 4 to 9 inches (10 to 23 cm) thick and are typically loams and gravelly loams. Bedrock is typically paralithic, sedimentary rock with fractures that allow root penetration. Permeability is moderately slow. Shrink-swell potential is moderate. Water erosion potential is high and wind erosion is slight.

Table 4. Representative soil features

Parent material	(1) Residuum – tuff (2) Loess – tuff (3) Lacustrine deposits – diatomite (4) Lacustrine deposits
Surface texture	(1) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow
Depth to restrictive layer	10 – 30 cm
Soil depth	10 – 30 cm
Surface fragment cover <=3"	0 – 50 %
Surface fragment cover >3"	0 – 50 %
Available water capacity (0-50.8cm)	2.29 – 3.56 cm

Soil reaction (1:1 water) (0-50.8cm)	6.6 – 7.3
Subsurface fragment volume <=3" (0-50.8cm)	30 – 90 %
Subsurface fragment volume >3" (0-50.8cm)	0 – 20 %

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	10 – 50 cm
Soil depth	10 – 50 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-50.8cm)	Not specified
Soil reaction (1:1 water) (0-50.8cm)	Not specified
Subsurface fragment volume <=3" (0-50.8cm)	Not specified
Subsurface fragment volume >3" (0-50.8cm)	Not specified

Ecological dynamics

In its reference condition, this site is dominated by bluebunch wheatgrass (*Pseudoroegneria spicata*), Thurber's needlegrass (*Achnatherum thurberianum*) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Wild crab apple (*Peraphyllum ramosissimum*) is a common shrub associate on this site. A diversity of forbs are also often present. Western juniper (*Juniperus occidentalis*) may be present in trace amounts, but under normal a disturbance regime is controlled by periodic fire.

Variability in site characteristics will alter plant composition. Needlegrasses increase over coarser textured soil surfaces. Wild crab apple increases over fractured soft tuffaceous sedimentary rock and diatomaceous earth. Antelope bitterbrush (*Purshia tridentata*) also increases over fractured substratums and on coarse textured soil surfaces. Despite the very shallow soils on this site, paralithic, fractured bedrock allows for Wyoming big sagebrush to persist on the site rather than species typically associated with very shallow soils such as rigid sagebrush.

Wyoming big sagebrush is fire intolerant species that is readily killed by most fires and does not resprout. It will be reduced on a site following fire and may be eliminated with frequent fires. Periodic insect outbreaks of Aroga moth (*Aroga websteri*) are an important component of the natural disturbance regime for big sagebrush, resulting in complete or partial mortality of sagebrush plants and potentially impacting thousands of acres (Innes 2019). Thurber's needlegrass is considered to be the least fire-resistant needlegrass, Thurber's is often damaged by moderately severe fire. It recovers slowly following fire and regenerates primarily by seed rather than resprouting from crowns (Archer 2000). Bluebunch wheatgrass is considered to be a highly fire adapted grass species with low buds often protected from fire. Recovery following fire is rapid and it often increases relative to other plants post fire, especially after spring burning. While burning may improve the nutritional quality of bluebunch, defoliation during the regeneration period can be very detrimental to the stand and grazing should be avoided immediately after (Zlatnik 1999).

Western juniper (*Juniperus occidentalis*) is a native conifer species in western North America but its density and range have dramatically increased since the late 1800s likely due to a combination of factors, namely: reductions in fire frequency; heavy livestock grazing; and increased atmospheric carbon dioxide (Fryer and Tirmenstein 2019). Juniper is sensitive to fire and most young trees are killed by even low severity fire. As Juniper trees mature and bark thickens, however, they become resistant to low severity fire yet are still killed by crown fires or high severity surface fires. Encroachment of juniper in the presence of an altered disturbance regime may have consequences for understory plant diversity and production, site hydrology and soil integrity with erosional states possible due to high levels of invasion.

Climate cycles would have been an important driver of ecological dynamics historically, with drought periods possibly leading to reductions in sagebrush cover and wet years increasing fire occurrence due to increased perennial grass production and fine fuels loads. Historically these communities would have likely encountered infrequent mixed and replacement severity fires with an average fire return interval of 50 years (yet with a high degree of variability depending on the site) (Landfire 2007). Livestock grazing has altered the plant community composition of much of the extent of this site.

If the site deteriorates in response to prolonged heavy grazing, big sagebrush, Sandberg bluegrass (*Poa secunda*) and bottlebrush squirreltail (*Elymus elymoides*) increase in plant density while bluebunch wheatgrass and Thurber's needlegrass decrease. Under an altered disturbance regime and degraded site conditions, invasions of exotic forb species and annual grass species may occur on this site. Exotic annual grasses such as cheatgrass (*Bromus tectorum*) and medusahead (*Taeniatherum caput-medusae*) may invade and become problematic. Exotic annual grass invasion may increase the size and frequency of fires and extend the season when fires are likely by augmenting early season fine fuel loads and fuel continuity. Sites may be particularly fire prone following years of above average precipitation during which invasive annual grass production can increase dramatically (Pilliod et al. 2017). In addition to exotic species, native shrub species such as broom snakeweed (*Gutierrezia sarothrae*) and rabbitbrush (*Chrysothamnus* spp.) may also increase following disturbance and may be important members of early seral communities.

An understanding of the site specific ecological dynamics for this site are incomplete. Thresholds between states and phases have yet to be quantified and restoration pathways and outcomes are not fully understood. Little is known about the ecological dynamics of wild crab apple and how it may respond to disturbance. Current and anticipated effects of climate change are not included in this model, yet this site may experience significant impacts as climate continues to change. The model below represents an approximation of ecological dynamics informed by disturbance response groups described in Stringham et al. 2017 and is likely to undergo refinements and revisions as more data becomes available. The reference plant community described below has been determined by study of rangeland relic areas or areas protected from excess disturbance.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					

1	Perennial Grasses			185-282	
	bluebunch wheatgrass	PSSPS	<i>Pseudoroegneria spicata ssp. spicata</i>	101-135	–
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	67-101	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	10-27	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	3-10	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	3-10	–
2	Other Perennial Grasses			0-20	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0-10	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-10	–
3	Cusick Bluegrass			0-10	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-10	–
Forb					
4	Forbs			10-27	
	buckwheat	ERIOG	<i>Eriogonum</i>	3-10	–
	phlox	PHLOX	<i>Phlox</i>	3-10	–
	milkvetch	ASTRA	<i>Astragalus</i>	3-7	–
5	Other Forbs			0-17	
	Douglas' dustymaiden	CHDO	<i>Chaenactis douglasii</i>	0-3	–
	blepharipappus	BLEPH2	<i>Blepharipappus</i>	0-3	–
	mariposa lily	CALOC	<i>Calochortus</i>	0-3	–
	ragwort	SENEC	<i>Senecio</i>	0-3	–
	blazingstar	MENTZ	<i>Mentzelia</i>	0-3	–
	hawksbeard	CREPI	<i>Crepis</i>	0-3	–
Shrub/Vine					
7	Shrubs			30-87	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	17-34	–
	wild crab apple	PERA4	<i>Peraphyllum ramosissimum</i>	7-27	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	7-27	–
8	Other Shrubs			0-7	
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	0-3	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	0-3	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-3	–
	horsebrush	TETRA3	<i>Tetradymia</i>	0-3	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	0-3	–
Tree					
6	Trees			0-3	
	western juniper	JUOC	<i>Juniperus occidentalis</i>	0-3	–

Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 15. Community 6.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 16. Community 7.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Animal community

WILDLIFE: Mule deer, hawks, rodents and songbirds. This site offers cover and food for mule deer, small mammals, and a variety of birds. LIVESTOCK GRAZING: This site is suitable for use by livestock under a planned grazing system. Limitations are low productivity, steep slopes and high susceptibility to erosion..

Hydrological functions

The soils of this site are in hydrologic group C. The site has a moderate to high run-off potential and low to moderate infiltration rates.

Wood products

None

Other information

Low available water holding capacity in the surface layer limits seedling survival. Shallow soils limit rooting depths.

References

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Contributors

2020/2021 update Andrew Neary

Approval

Kirt Walstad, 3/10/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	03/10/2025
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover (%) and depth (in):

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):

16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability:
